PROJECT DESCRIPTION

INTRODUCTION

The Borrego Valley is located in the northeast corner of San Diego County **(Figure 1)** in the westernmost part of the Sonoran Desert, 80 miles northeast of San Diego and 30 miles west of the Salton Sea. Located within the Borrego Valley Groundwater Basin in the Colorado River Region, the area is bounded on the west by the San Ysidro Mountains, the north by the Santa Rosa Mountains, the south by the Valecito Mountains and the east by the Coyote Creek Fault.

The Valley is home to approximately 3,000 residents in the unincorporated community of Borrego Springs. This rural village is also home to 4,000 acres of agriculture, four golf courses and is completely surrounded by the Anza-Borrego Desert State Park which averages 600,000 visitors annually. Borrego Springs is considered a "disadvantaged community" in that the annual median household income (MHI) is less that 80% of the Statewide MHI.

One of the most important factors of the area is the Borrego Valley aquifer, the sole source of water supply for the area. The aquifer, although quite large, has been in an overdraft situation since 1945 when the water extraction began to exceed the natural replenishment. According to 2011 records, the overdraft is approximately 15,000 acre feet per year (AFY) based on the annual extraction rates of 19,700 AFY and natural recharge of 4,800 AFY.

The Borrego Valley Groundwater Quality Baseline Project is a first step in harnessing both the existing water quality data over the past sixty years while incorporating a baseline strategy of how future water quality sampling will be handled. Historically, water quality sampling has been collected for single wells with no plan of tying the data to adjacent wells or incorporating the down-hole perforation schedule to separate the quality at depth. It was basically a two-dimensional data point that did not incorporate depth of the water bearing zones. Over the years it has become increasingly apparent that wells perforated at different intervals can have drastically different water quality results. Three major accomplishments to help facilitate this project include the 2002 Borrego Water District (BWD) Groundwater Management Plan, the update of the 1987 United States Geological Survey (USGS) numeric model and the 2009 USGS/DWR/BWD "water well roundup".

The goal of this project is to compile all existing water quality data, plot the locations with the results, analyze the data for coverage gaps, design a program of which particular water quality constituents to sample, secure future sampling sites and develop a plan to continue the sampling into the future. The data will be utilized for mapping water quality trends as the water table lowers due to overdraft conditions in the Borrego Valley. Overall benefits would include identifying the effects on future water usability, creation of permanent database, general understanding of water quality throughout the basin and determination of possible nitrate degradation in the Valley.

KEY FACTORS LEADING UP TO THIS PROGRAM

Starting in 1999, the Borrego Water District began work on a groundwater management plan (GWMP). The plan incorporated input from technical personnel of the USGS, DWR, County of San Diego and District hydrogeologic consultants. This "technical committee" met over the course of several months and developed a plan to deal with the groundwater overdraft. In parallel meetings, a "policy committee" made up of persons representing the County, the farming community, the Anza-Borrego Desert State Park, the Borrego Water District and other key local interest groups reviewed the work of the technical committee. The program was vetted through several town hall meetings, adopted in 2002 and updated in 2006. The Groundwater Management Plan outlined programs to address water quality but to date; no program has been funded to complete the work.

In 2009, the District entered into a three-year agreement with the USGS to update the previous work performed in the 1982 and 1987 open file reports. Included in this project was the upgrading of the numeric model of the groundwater basin. The first phase of this project was to take the 1987 model and incorporate current water levels in the "static model". The next step incorporated more recent methods utilizing "ModFlow" data, from San Diego State University graduate study thesis work. The data collected and interpolated by hydrogeologists Tom Henderson and Steve Netto was purchased by BWD in 2007. This data was provided to the USGS to upgrade the numeric model with modern software data "dynamic model". Data presented at the BWD annual Town Hall Meetings, projected the water levels into the future under various scenarios. By far the most persuasive was the "no change" scenario. This scenario depicted the upper, and most prolific of the three known aquifers in the Borrego Valley, will be exhausted in fifty years. The USGS report will be released by the end of 2012 and the model will be available for future analysis of the basin.

The "water well roundup" identified 160 wells in the Borrego Valley that were identified by State Well Number and present landowner. In addition, the wells were linked to the Well Driller's Logs, marked with longitude/latitude coordinates, surface elevation, water level measurements and any other details involving the historical usage. This was a joint-venture project, funded by BWD and incorporated the existing water well driller's logs for the DWR database and field locating on specific wells with high-precision global positioning equipment by the USGS. The DWR also provided field surveys including static water level measurements and tagging bottom of certain wells to verify total completed well depth. The DWR then processed all of the new information into a spreadsheet format. This was the first project of this magnitude with the goal of surveying Valley-wide well locations and linking them to the corresponding well information.

To date, a considerable amount of effort has been expended on proving the fact that the Borrego Valley Aquifer is in a state of overdraft; however, the declining water levels in Valley wells tell the story. The pumpers in the Valley are extracting more water than can naturally be replenished. BWD has been working with federal, state and local agencies to explore solutions

to the overdraft. **Table 1** represents projects in which BWD has participated to address water supply issues.

TABLE 1

PROGRAMS ADDRESSING WATER SUPPLY ISSUES

1968: "Inland Basins Projects", U.S. Bureau of the Reclamation.

1982: "Water Resources of Borrego Valley and Vicinity, California", Phase 1 - Definition of Geologic and Hydrogeologic Characteristics of Basin. U.S. Geological Survey Open File Report 82-855

1983: "Preliminary Evaluation of Annual Recharge to the Borrego Valley Ground Water Basin. Study Code No. 1335-11-B-1, Kenneth Hatai, California Department of Water Resources.

1983: "Preliminary Evaluation of Historical and Projected Water Demand for Borrego Valley", Study Code No. 1335-12-C-1, Kenneth Hatai, California Department of Water Resources.

1984: "Borrego Valley Water Management Plan", California Department of Water Resources.

1987: "Water Resources of Borrego Valley and Vicinity, California", Phase 2 - Development of a Ground-Water Flow Model. U.S. Geological Survey Open File Report 87-4199.

1996: "3-D Geophysical Studies of the Upper Borrego Valley Final Report", Report 9524-200-004, prepared for Kajima Engineering and Construction, Pasadena, CA by Agbabian Associates, Corona, CA

2001: "Hydrogeologic and Numerical Modeling of the Borrego Valley Aquifer System", a thesis presented to the faculty of San Diego State University by Thomas Henderson, fall 2001.
and "Water Resources of Borrego Valley, San Diego County, California", a thesis presented to the faculty of San Diego State University by Steven Netto, Fall 2001.
NOTE: Work product (ModFlow data) of Henderson and Netto purchased by Borrego Water District in 2004. This data was incorporated in the U.S. Geological Survey model update.

2002: "Groundwater Management Plan", Borrego Water District, adopted October 2002 through Board Resolution No. 2002-10-1.

2003: "Groundwater Management Plan Implementation Phase 1", Borrego Water District, grant through the Local Groundwater Management Assistance of 2000, agreement number 4600003174, , California Department of Water Resources.

2006: "Update to Appendix A-07 to the Groundwater Management Plan", Borrego Water District, approved by Board of Directors, May 2006.

TABLE 1 (continued)

2006: "Borrego Water District Groundwater Test Well Project 2006", ", Borrego Water District, grant through the Local Groundwater Management Assistance of 2000, agreement number 4600003174, , California Department of Water Resources.

2007: "Borrego Spring Pipeline Feasibility Study", Borrego Water District, grant to determine the feasibility of importing water from outside the Valley, by the U.S. Environmental Protection Agency through the State and Tribal Assistance Grant program. Final Report by Jerry Rolwing, March 2012.

2008: "Evaluation of Ground-Water Conditions and Land Subsidence in the Borrego Valley, California", a joint funded project by the U.S. Geological Survey, California Department of Water Resources and the Borrego Water District to update the 1982 and 1987 USGS model work. Final Report expected by the end of 2012.

2009: "Water Level Roundup", joint venture project to identify all wells in the Valley and link well to state well number, location data and water well driller's log, funded by the Borrego Water District with U.S. Geological Survey and California Department of Water Resources.

2009: "Anza Borrego Desert Integrated Regional Water Management Group", approved through the Regional Acceptance Process of the California Department of Water Resources. Formation group includes County of San Diego and the Resource Conservation District of Greater San Diego County.

2010: "Southeast California Basin Study", grant to explore the possibility of securing water from outside of the Valley funded by the Water Smart Program of U.S. Bureau of Reclamation with in-kind contributions by the Borrego Water District. Final report expected March 2013.

2012: "Anza Borrego Desert Planning Grant Proposal", grant submitted by RMC Water and Environment for the Anza Borrego Desert Integrated Regional Water Management Group, funded by the Borrego Water District in March 2012. Presently awaiting final grant award selection expected July 2012.

PROGRAMS ADDRESSING WATER QUALITY ISSUES

2012: "Groundwater-Quality Data in the Borrego Valley, Central Desert, and low-Use Basins of the Mojave and Sonoran Deserts Study Unit, 2008-2010: results from the California GAMA Program", Data Series 659, U.S. Geological Survey and California State Water Resources Control Board.

WATER QUALITY HISTORY

In the 2002 GWMP, water quality is addressed as generally good, with several pockets of water where nitrates levels exceed the maximum contaminant level of 45 parts per million. Since the mid-1970's two public domestic wells operated by the Borrego Springs Water Company (now Borrego Water District) exceeded State levels and were taken out of service. Two of the local mobile home parks have since been ordered by the San Diego County Department of Environmental Health to stop utilizing their private wells for potable uses due to high nitrate concentrations. Both parks are now served by BWD and the larger of the two is utilizing the high nitrate water supply for their landscape irrigation needs.

Historical water quality records have been maintained on Borrego Water District production wells to track any deterioration of water quality to a particular well. The Borrego Water District, as required by the California Department of Public Health Title 22 regulations, maintains a series of water quality data since the regulatory agency has imposed the testing. Other Valley-wide testing has been performed by various Federal and State agencies over the years, but not much data has been collected over the past thirty years except for the recent Groundwater Ambient Monitoring and Assessment (GAMA) program. Some data from agricultural and golf course pumpers is available but does not provide much detail in that these groups only tested for certain constituents pertinent to their operations.

The Borrego Valley has never been subjected to any large industrial activities. Farming and golf course irrigation have been the major activities utilizing the Valley's aquifer. Although today, many of the farming operations are certified "organic", there is some suspicion that fertilizers and pesticides were spread over the historical DiGiorgio Grape farming operation. The vineyards occupied over 1,000 acres of farmland from the 1940's to the late1960's. However, no specific study has been completed to investigate the present and past use of fertilizers and pesticides in the Valley. The small unincorporated village of Borrego Springs and its 3,000 inhabitants pump approximately 10% of the Valleys' total water extraction. Less than 20% of the population is connected to the wastewater treatment facility operated by the Borrego Water District. The remaining 80% utilize individual septic systems which both evaporate, and percolate, into the groundwater basin. In 2008 the Borrego Water District applied for a grant through the California Department of Public Health to perform a feasibility study for connecting all residents to the wastewater treatment facility to reduce the possibility of contaminating the sole source domestic aquifer from the individual septic systems. The application was denied for lack of data suggesting that a water quality problem exists. Funding from this source requires a water system to be out of compliance to receive funds and does not allow a water purveyor to address potential future problems.

Completely surrounding the Valley is the 600,000 acre Anza-Borrego Desert State Park. The majority of the land comprising the Borrego Valley Watershed is protected from contamination by various wilderness areas and other Park regulations precluding activities detrimental to the environment. The Park is a very good neighbor and will be included in any stakeholder activities emanating from this program.

HOW THE PROJECT SUPPORTS THE GOALS AND OBJECTIVES OF THE GWMP

The Borrego Water District Groundwater Management Plan was adopted on October 18, 2002 by Board Resolution No. 2002-10-1. In the spring of 2006 a groundwater management sub-committee recommended updates to Appendix A-07 of the Groundwater Management Plan and the update was approved by the Board of Directors at the May 24, 2006 regular meeting.

The GWMP is a well vetted document and included input by a number of local and professional experts in the field. This planning process is detailed in section number four of the GWMP. Within this section, eight components of a successful GWMP are listed as the guidelines to be followed in designing this plan. Component number five, management objectives, states that "management objectives shall establish values for acceptable changes in groundwater levels, groundwater quality, inelastic land subsidence and changes in stream flow and habitat".

To address this component, part eight of the GWMP details the Adopted Goals and Objectives. Of the eight goals, goal number three states "continue to expand the District's knowledge of the water resources of the aquifer and its water resources" with the objective to "develop additional programs to measure the water resources of the valley". The water quality aspect is further fortified in goal number five "work with state and county agencies to try to minimize any adverse impact that new land use will have on groundwater resources and groundwater quality", with the objective to "maintain water quality throughout the valley at the current standard". Section nine goes on to define "programs to implement the plan". Of the nine programs, number five directs District staff to work with State and Regional Water Quality Control Board staff regarding water quality issues. Program number six follows up by directing "programs that provide more information about the aquifer".

In the 2006 update to the GWMP, item #2 of the Technical/Scientific section enforces the need for the water quality aspect of the Valley by stating: "Design and implement a water quality monitoring program throughout the Valley to include tests of the lower levels of the aquifer".

HOW THE PROGRAM WILL WORK

The program will begin with the selection of a qualified professional California Certified Hydrogeologist to administer the program followed by meetings with Federal, State and local water resource professionals to design a program to meet the needs of all entities. Next a meeting of local stakeholders will outline the proposed project and solicit local input and support. Once the program is designed and vetted, a compilation of all existing water quality data from the Borrego Water District, County of San Diego, California Department of Water Resources and the United States Geological Survey will be incorporated into a common dataset. Once all known data has been compiled, the hydrogeologist will locate and match the wells in the dataset to well driller's logs. This will facilitate the physical location of the well and the down-hole zones where the well perforations exist. This task will also aid in indentifying "where the water is coming from" in the aquifer. The next step will be to plot the existing locations into a geographic information system (GIS) to be utilized for the design of a future

monitoring program. With all the data in visual format, a second meeting of the water resource professional group will be held to design the future monitoring program and determine the constituents the program will be sampling. A second stakeholder meeting will preview the existing data and proposed monitoring plan. The data presented at this meeting will identify areas where data gaps exist and solicit private wells to aid in filling those gaps. Well access documents will be drafted and negotiated with "willing" well owners. The benefits of the proposed program will continue for many years to come. Historically the concept of a "water quality program" has been tossed around but lacked direction or a platform to host the data. This project will attempt to accomplish the following:

- Provide platform for the existing data collected to date in a retrievable format
- Visually depict where the existing pockets of data fit into the big picture
- Understand where in the Valley that more data is required
- Get direction from professionals on what constituents should be sampled
- Work with agriculture and golf course pumpers to include their water quality needs
- Design and initiate well access agreements with private well owners
- Create an opportunity to work together as "neighbors" to address the future of the aquifer

The Borrego Valley Groundwater Quality Baseline Study will bring the existing data together into a single dataset so that an understanding of current quality characteristics can be made. Also, the data can then be organized to work with future "depth dependent" water quality projects as the Borrego Water District moves forward on future projects. The main focus of the baseline project is to set up a program, based on science not convenience, to track the future water quality conditions of the Borrego Aquifer. This will allow the community to prepare for the future water quality impacts that may occur in the future as groundwater levels decline within the aquifer.

ONGOING PLANS FOR THE PROGRAM AFTER THE GRANT PERIOD

Once this program is established, the Borrego Water District is committed to working with the other Valley pumpers to fund future rounds of water quality sampling on the same annual basis. To reduce costs, the sampling schedule will be incorporated into the District's existing well sampling program. This existing water sampling program is a requirement of the California Department of Public Health and could dovetail with future sampling requirements of the California Regional Water Quality Control Board. As the water table continues to decline, it is anticipated that water quality levels could deteriorate. This program will act as an "early warning" system for the Valley pumpers. The data will portray trends that will enable pumpers to prepare for any change in water quality. The data will be input into the database as results are submitted and will be available for any future analysis with the groundwater model. All future data will be submitted for incorporation into the Groundwater Ambient Monitoring and Assessment GAMA program.